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Date: February 20, 2008 Name: G. Peter Nichols Signature: /G. Peter Nichols/

**Case No. 9378/192**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:	)	
	)	
Roche et al.	)	
	)	Examiner: Bos
Serial No.: 10/531,784	)	
	)	Group Art Unit No.: 1754
Filing Date: February 16, 2006	)	
	)	Confirmation No. 1890
For: Production Of Titania	)	

**RESPONSE**

Commissioner for Patents  
Mail Stop: AF  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

In response to the Final Rejection mailed September 20, 2007, for which the Applicants respectfully request a two-month extension of time, please reconsider the claims in light of the following amendments and remarks.

**Listing of the Claims:**

This listing of the claims will replace all prior versions and listings of claims in the application.

1. (Previously presented) A sulfate process for producing titania from a titaniferous material which includes the steps of:
  - (a) leaching the titaniferous material with a leach solution containing sulfuric acid and forming a leach liquor that includes an acidic solution of titanyl sulfate ( $\text{TiOSO}_4$ ) and iron sulfate ( $\text{FeSO}_4$ );
  - (b) separating the leach liquor and a residual solid phase from the leach step (a);
  - (c) precipitating iron sulfate from the leach liquor from step (b) and separating precipitated iron sulfate from the leach liquor;
  - (d) extracting titanyl sulfate from the leach liquor from step (c) with a suitable solvent and thereafter stripping titanyl sulfate from the solvent and forming a solution that contains titanyl sulfate;
  - (e) using at least part of a raffinate from solvent extraction step (d) as at least part of the leach solution in the leach step (a);
  - (f) hydrolysing the solution that contains titanyl sulfate and forming hydrated titanium oxides from the titanyl sulfate;
  - (g) separating a solid phase containing hydrated titanium oxides and a liquid phase that are produced in the hydrolysis step (f); and
  - (h) calcining the solid phase from step (g) and forming titania.
2. (Previously Presented) The process defined in claim 1 further comprising a further leach step of leaching the residual solid phase from step (b) with a leach solution containing sulfuric acid and forming a leach liquor that includes an acidic solution of titanyl sulfate and iron sulfate and a residual solid phase.
3. (Previously Presented) The process defined in claim 2 further comprising

carrying out the leach step (a) and the further leach step in the same vessel.

4. (Original) The process defined in claim 3 wherein the further leach step includes returning the residual solid phase from step (b) to the vessel.

5. (Previously Presented) The process defined in claim 4 further comprising carrying out the leach step (a) and the further leach step in separate vessels and supplying the residual solid phase from the leach step (a) to the separate vessel or vessels.

6. (Original) The process defined in claim 5 wherein the further leach step includes separating the leach liquor and a further residual solid phase formed in the further leach step.

7. (Previously Presented) The process defined in claim 6 further comprising supplying the separated leach liquor to the leach step (a) or mixing the separated leach liquor with the leach liquor from step (b).

8. (Previously Presented) The process defined in claim 2 wherein step (e) includes using at least part of the raffinate from solvent extraction step (d) as at least part of the leach solution in the further leach step.

9. (Previously Presented) The process defined in claim 1 wherein the leach step (a) and/or the further leach step includes selecting and/or controlling one or more leach conditions in the leach step or steps to avoid undesirable amounts of premature hydrolysis of hydrated titanium oxides and undesirable amounts of premature precipitation of titanyl sulfate.

10. (Original) The process defined in claim 9 wherein the leach conditions include any one or more than one of acid concentration, leach temperature and leach time.

11. (Previously Presented) The process defined in claim 9 further comprising selecting and/or controlling the acid concentration to be at least 350 g/l sulfuric acid throughout the leach step (a) and/or the further leach step when operating at a leach temperature in the range of 95°C to the boiling point in order to avoid premature hydrolysis.
12. (Previously Presented) The process defined in claim 9 further comprising selecting and/or controlling the acid concentration to be less than 450 g/l at the end of the leach step (a) and/or the further leach step when operating at a leach temperature in the range of 95°C to the boiling point in order to avoid an undesirable amount of premature precipitation of titanyl sulfate.
13. (Previously Presented) The process defined in claim 9 further comprising selecting and/or controlling the leach conditions so that the titanium ion concentration in the leach liquor is less than 50 g/l in the leach liquor at the end of the leach step (a) and/or the further leach step.
14. (Previously Presented) The process defined in claim 1 wherein the raffinate from the solvent extraction step (d) has an acid concentration of at least 250 g/l sulfuric acid.
15. (Previously Presented) The process defined in claim 1 further comprising carrying out the leach step (a) and/or the further leach step in the presence of a leaching accelerant that accelerates the rate of leaching the titaniferous material.
16. (Previously Presented) The process defined in claim 13 wherein the leaching accelerant is selected from the group consisting of iron, a titanium (III) salt, a thiosulfate salt, sulfur dioxide, a reduced sulfur containing species, and mixtures thereof.
17. (Previously Presented) The process defined in claim 1 further comprising carrying out the leach step (a) and/or the further leach step in the presence of a

reductant that reduces ferric ions to ferrous ions in the acidic solution or solutions of titanyl sulfate and iron sulfate produced in the leach step (a) and/or the further leach step.

18. (Previously Presented) The process defined in claim 17 wherein the reductant is selected from the group consisting of iron, a titanium (III) salt, a thiosulfate salt, sulfur dioxide, a reduced sulfur containing species, and mixtures thereof.

19. (Previously Presented) The process defined in claim 1 wherein the solvent extraction step (d) includes contacting the leach liquor with the selected solvent and a modifier.

20. (Previously Presented) The process defined in claim 1 further comprising controlling the hydrolysis step (f) to produce a selected particle size distribution of the hydrated titanium oxides product.

## REMARKS

All the claims have been rejected as Claims 1-20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Rahm in view of Watanabe. Applicants respectfully traverse.

The premise of the Examiner's reasoning to support combining Rahm and Watanabe is that "each reference is drawn to a similar sulfate process" (page 3). Applicants cannot agree. Watanabe points out that the described process overcomes the disadvantages of the prior art, of which Rahm formed part of (see col. 5, lines 51-52). In addition, Rahm does not disclose or suggest step (e) of claim 1, i.e., using at least part of a raffinate from solvent extraction step (d) as at least part of the leach solution in the leach step (a). Applicants acknowledge that the Examiner has stated that Watanabe teaches this feature at col. 6, lines 26-31. Presumably, the Examiner contends that the combination of Rahm and Watanabe teach all the features of the claim.

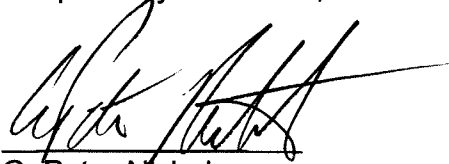
While it is true that at col. 6, lines 26-31 Watanabe mentions that a part of the raffinate is recycled, a full explanation of the recycling is found at col. 14, lines 34-46. There, Watanabe explains that the extraction raffinate is introduced to a dissolution stage R so that the reaction products formed from the digestion stage Q, where the titanium-containing raw material is mixed with sulfuric acid (i.e., the stage most synonymous with the claimed leaching step (a)). In short, Watanabe teaches recycling the extraction raffinate at a process location downstream from the leaching. Put another way, Watanabe does not teach step (e) of the claim because Watanabe does not use any part of the raffinate from the solvent extraction as part of a leach solution to

leach the titaniferous material. Because the Examiner admits that Rahm does not teach step (e) of claim 1, the combination of Rahm and Watanabe cannot teach all the features of claim 1. Because each feature required by claim 1 is not taught or suggested by the combination of Rahm and Watanabe, the claim is patentable over their combination. Withdrawal of the rejection is requested.

With respect to the obviousness-type double patenting rejections, they will be addressed upon notification that the present claims are allowable.

It is believed that all the claims are in condition to be allowed. The Examiner is invited to contact the undersigned attorney for the Applicant via telephone if such communication would expedite allowance of this application. If, for any reason, the Examiner feels that the above amendments and remarks do not put the claims in condition for allowance, the undersigned attorney can be reached at (312) 321-4276 to resolve any remaining issues.

Respectfully submitted,



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